

EXPONENTIAL INTEGRATORS FOR THE INCOMPRESSIBLE NAVIER-STOKES EQUATIONS

C. Newman^a and R. Lehoucq^b

^aSandia National Laboratories
PO Box 5800, MS 1110
Albuquerque, New Mexico 87185-1110
cnewman@sandia.gov

^bSandia National Laboratories
PO Box 5800, MS 1110
Albuquerque, New Mexico 87185-1110
rblehou@sandia.gov

Exponential integrators, used typically to solve systems of ordinary differential equations, utilize the exponential of the Jacobian, which can be approximated efficiently by Krylov subspace methods. These methods provide an unconditionally stable time integration with many of the advantages of explicit methods. Our goal is to develop exponential integration methods for use in solving large systems of differential-algebraic equations such as occur in fluid flow problems. In particular, we focus on the reduction in computational resources required in these methods over requirements for conventional methods for solving the incompressible Navier-Stokes equations. Comparisons of an exponential integrator with implicit and semi-implicit projection methods will be presented.